

RADIO CITY PRODUCTS COMPANY, INC.

127 WEST 26TH STREET

NEW YORK 1, N. Y.

MANUFACTURERS OF PRECISION ELECTRONIC LIMIT BRIDGES — VACUUM TUBE VOLTMETERS
— VOLT-OHM-MILLIAMMETERS — SIGNAL GENERATORS — ANALYZER UNITS — TUBE TESTERS
— MULTI-TESTERS — OSCILLOSCOPES — AND SPECIAL INSTRUMENTS BUILT TO SPECIFICATIONS

INSTRUCTION MANUAL FOR
OPERATION AND USE OF THE RADIO CITY PRODUCTS
MODEL 777A SIGNAL TRACER

GENERAL

The RCP Signal Tracer, Model 777A has been designed to be a timesaving device facilitating the servicing of AM-FM receivers, audio amplifiers, and television sound systems. It is an aid to the serviceman in locating faulty components, stages, stage gain, distortion, hum, etc. The unit contains an AC operated, three-stage amplifier with traveling probe. The probe allows direct insertion into stages carrying radio frequency currents.

In addition to the RF probe, a special microphone-phonograph connector is provided so that the functioning of either high impedance microphones or phonograph pickups may be determined. The step and vernier attenuator is accurately calibrated so that direct reading stage gain measurements may be made.

Due to the extremely high sensitivity of the newly developed 777A, a slight hum may be noticed when used "wide open". If this is the case, the line cord should be reversed in the AC socket. The same effect may be had by grounding the case through a .05 mfd. condenser to a water pipe, metal conduit, etc.

POWER

The Model 777A is intended for use on 110 volt 60 cycles only. IMPORTANT.....Do not attempt to use this instrument on anything but ALTERNATING CURRENT.

PROBE

The probe housing contains a detector, a distinct advantage where high sensitivity and low noise pickup are required. The design enables the operator to make insertions directly into RF carrying circuits. Due to the low input capacity (3 mmfd.), little, if any, detuning will be experienced in receiver circuits tested. Although the probe is ruggedly supported, EXCESSIVE DROPPING ON A HARD BENCH OR SURFACE WILL CAUSE DAMAGE. Such a condition will become apparent by the presence of noise and loss of sensitivity.

SIGNAL ATTENUATION

Controls (Vernier Attenuator and Step Attenuator) are used to provide signal attenuation. The vernier serves to reduce the signal in unit increments, whereas the step attenuator reduces the signal in progressive steps of ten. The primary purpose of the calibrated attenuator is in making stage gain measurements. Although it is not possible to overload the probe or following amplifiers, the fidelity attained at high volume makes distortion analysis difficult. It has been found that normal volume will show up receiver distortion readily, therefore, the use of the VERNIER ATTENUATOR control should be reduced as progressive tests are made where amplification is noted.

SPEAKER - METER SWITCH

A four-position slide switch is provided so that the desired output of the signal tracer may be selected at will. In addition to the SPEAKER-OFF position, which in reality is a standby position, three other functions are provided so that the meter, speaker or meter and speaker may be used individually or in combination.

MEASURING STAGE GAIN

Stage gain measurements may be made using the Model 777A Dynatracer. The procedure is as follows: With a suitable signal passing through the amplifiers under test, connect the probe of the Dynatracer to the grid of the tube whose gain you desire to determine - set the step attenuator so that the signal is audible in the Dynatracer

speaker with the switch in the "Meter - Speaker" position. Then adjust the Vernier attenuator so that the meter reads somewhere between 1 and 5. Note the vernier setting and the step attenuator setting - expressing the vernier settings in terms of tenths of maximum clockwise rotation, divide the step attenuator setting by the vernier setting. As an example: Suppose the Step Attenuator setting for a given meter reading to be 100 and the vernier meter to be 100 and the vernier setting 3. Divide 100 by 0.3 then 333 is the first attenuator factor - next, connect the probe to the grid of the following stage - adjust the attenuators until the same meter reading is obtained as before. Assume that the setting of the vernier attenuator is now 5 and the setting of the Step Attenuator is 1000 - dividing 1000 by 0.5 equals 2000. The second attenuation factor is therefore 2000. The gain of the stage is equal to the 2nd attenuator factor or 2000 divided by 333 which equals 6 - the stage gain.

If the overall gain of an IF, RF or Audio system is to be measured, the probe is first attached to the input of the system and this reading should then be followed by a reading taken with the probe connected to the output of the system. Dividing the attenuation factor obtained at the output by that obtained at the input will give you the gain of the system.

SIGNAL TRACING

NOTE: It may be found in signal tracing a receiver by the method outlined below, that very weak response will be noted when the probe is used on the RF or IF circuits. Should the above be the case, it is necessary to short out the AVC so that a strong signal will not bias off and reduce the gain of a stage under test.

In areas where the signal strength of local broadcast is not sufficient to produce an audio output when the signal tracer probe is placed on the antenna, it will be necessary to use an R.F. Signal Generator as a source of signal such as an RCP 705A or RCP 710.

With the use of a Signal Tracer such as the Radio City Model 777A, the necessity for testing tubes measuring voltages and other tedious and time-consuming methods previously used by radio servicemen is eliminated. The fundamental idea in the use of the Signal Tracer is to trace the signal through a radio receiver from the antenna to the speaker, checking its strength and quality at each point where the signal appears. Due to the sensitivity of the RCP signal tracer, it is possible to pick up local broadcast stations directly on the radio loop or external antenna. Assuming that the probe is connected to the primary side of the antenna coil or loop, no selectivity should be experienced and more than one local station should be heard. Moving the probe to the secondary side of the antenna coil or attached to the grid of the first RF tube, it should become possible by tuning the receiver to select one broadcast station at a time. This, of course, will be true if the antenna coil, variable condenser, and associated wiring are functioning properly. It is well to select a broadcast station at the low frequency end of the band and trace its path through the receiver. The reason for this choice concerns the detuning effects of the probe, since little, if any, effect would be noticed at the lower frequencies. It is understandable that 3 mmf. probe capacity added to the 300 or more mmf. of the tuning condenser would cause a small percentage of added capacity. However, at the high frequency end of the band the same capacity added to the small tuning capacity used would add larger percentage of capacity.

Assuming that the sensitivity of the receiver enables the selection of one low frequency broadcast station, the probe can be shifted to the plate of the first RF tube. If amplification exists in this particular stage, the signal strength will be much greater. If the desired results are obtained, the probe can be moved to the following grid and should give approximately the same volume as heard on the plate of the preceding tube. If the signal disappears entirely, trouble could be isolated in the tuning components, IF transformer, etc. Should the signal be attenuated to a large degree, it is possible the RF coil or IF transformer is detuned so that further passage of signal would be improbable. The probe can be moved over to the plate of the second tube and the rise in amplification experienced in the plate test of the preceding stage should occur again. The amplification should be such by this time that the sensitivity control on the Signal Tracer will have to be reduced so that distortion and the effect of overload are eliminated. It must be remembered that the RCP Signal Tracer cannot be damaged by application or strong signals to the probe, but in interest of good speaker quality and the ability to make comparative amplification measurements, the sensitivity should be decreased progressively as amplification occurs.

The Signal Tracer is not directly able to measure the local oscillator performance, but the effects of such performance may be easily determined. If, for example, the Signal Tracer probe were applied to the grid of the mixer tube with a good strong signal present, but the same signal could not be heard at the plate of the same tube, it is reasonable to assume that such action could be caused by faulty oscillator operation. Obviously the output of the oscillator being pure RF, the resultant demodulation or detection by the Signal Tracer would produce no results that could be heard in the speaker. The testing of the IF stages and the subsequent increase in signal, which should be experienced by moving the probe from the grid of an IF tube to its plate, should be carried on, depending on the number of stages which the set contains. In order to ascertain the second detector performance, it is well to apply the probe to the high end of the volume control. If no signal is heard at this point, the probe may be applied to the high end of the last I.F. transformer secondary. The audio frequency stages are checked in a manner similar to that of the RF stages in that the probe is moved from the grid to the plate, finally completing the test at the output speaker voice coil. DURING ALL THE ABOVE TESTS, THE GROUNDING LEAD PROVIDED WITH THE SIGNAL TRACER SHOULD BE ATTACHED TO THE CHASSIS IN A LOCATION AS CLOSE TO THE POINT OF TEST AS PRACTICABLE. The exception to the above is for the last test in signal tracing the receiver, that is, the test across the voice coil winding of the output transformer. The grounding lead in this case, will have to be attached to either side of this transformer winding with the probe attached to the other. The necessity for such a deviation from the normal procedure is due to the above ground wiring of the voice coil circuits of most radio receivers. All other measurements, whether RF or IF, ultimately return to chassis or ground potentials, therefore, the ground lead is connected to the chassis.

The above test procedure should be used for making the actual receiver repair. The following procedure can well be used for giving a quick estimate for a customer with not too conclusive results of the exact faults a receiver might contain.

The probe may be attached to the grid side of the antenna loop in order to ascertain trouble in the tuning portion of a radio receiver. This and the tests listed below can be done without removing the receiver from the chassis. With a piece of bent wire attached to the probe ending, connection may be made to one of the screws of the IF transformer. The signal, although weak, will be heard. Such a result would indicate that the mixer stage and oscillator are functioning. If an RF stage precedes the mixer, the stator plate or its connection to the RF tube grid should be tested with the probe so that the functioning of the RF stage may be determined. If, however, no RF stage is used, the IF transformer screws make good test points and can be traced through the circuit to the detector stage. In this way, troubles usually experienced, such as open IF transformers, dead oscillators, etc., may be rapidly checked and estimates given in the shortest possible time. The only test that cannot be made without removing the chassis on the audio section, is that of the output transformer secondary and speaker voice coil. In most cases, these connections are available on the back of the receiver and do not necessitate removal of the chassis.

REPAIR SERVICE

When returning any Radio City Products instrument for service, ALWAYS pack carefully in a strong, oversized corrugated shipping container, using a generous supply of padding such as excelsior, shredded paper, or crumpled newspaper. The original container and its pads (if available) are ideal for this purpose. Ship PREPAID and mark for:

RADIO CITY PRODUCTS CO., INC.
152 West 25th Street
New York 1, N. Y.

ATT: Service Division

Fragile label should appear on at least four sides of the carton.

NEVER return an instrument unless it is accompanied by full explanation of difficulties encountered. The more explicit the details, the more rapidly your instrument can be handled and processed.

If the unit is mailed, the explanation should be attached as a letter to the outside of the package with its appropriate first class postage. Do not enclose the explanation in any 3rd class mailed package, as this may delay our receipt of the unit and its consequent repair.

GUARANTEE

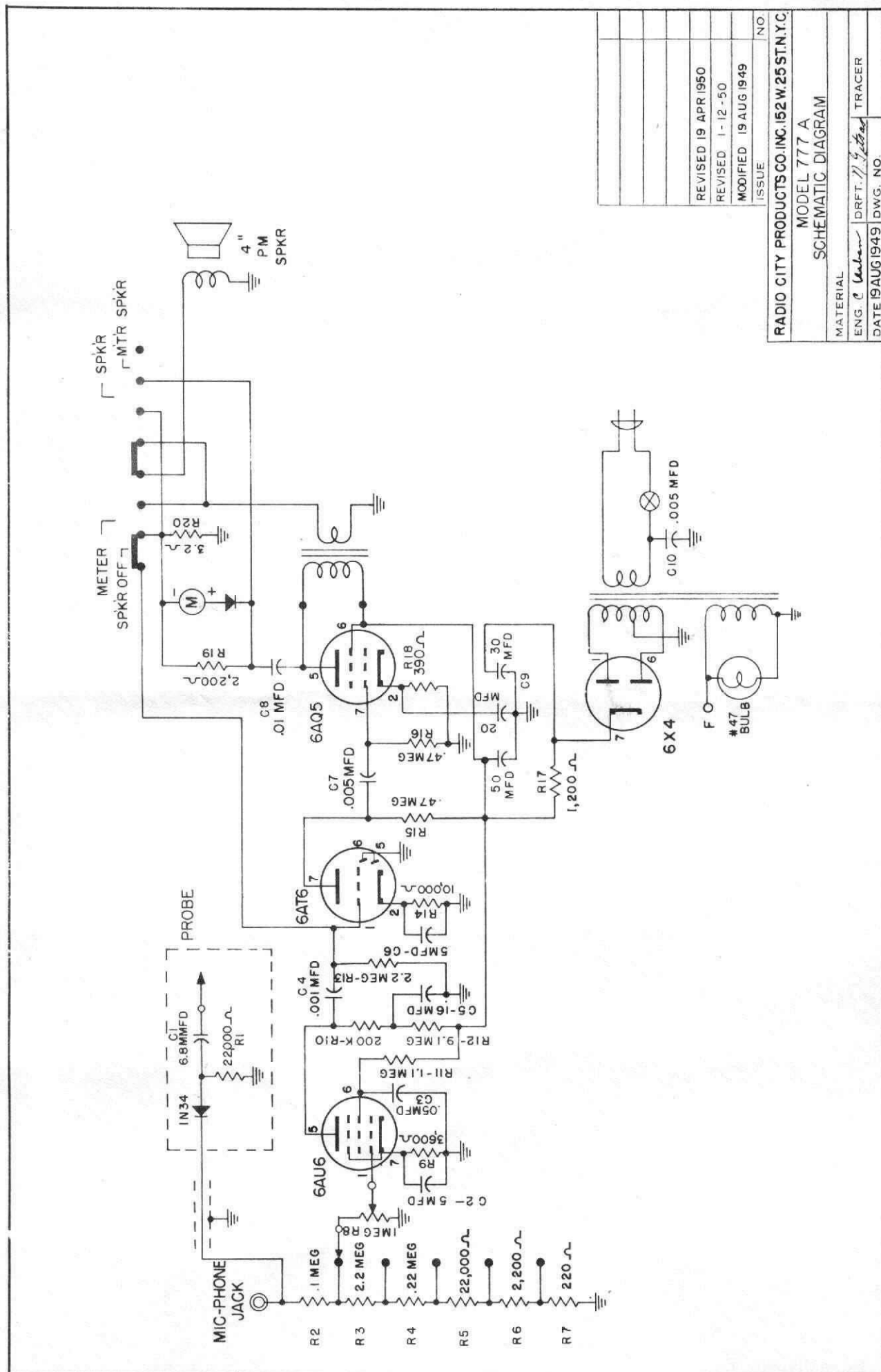
The instrument is guaranteed to be free from any defect in material and workmanship that may develop within a period of 90 days from date of purchase under the terms of the standard RMA guarantee. Any part or parts that prove defective within this period will be replaced without charge when subjected to examination at our factory, providing such defect is, in our opinion, due to faulty workmanship or material, and not caused by tampering, abuse or normal wear.

Radio City Products Company, Inc. reserves the right to make changes in design or add improvements to instruments manufactured by them without incurring any obligation to install any changes or improvements in any instrument previously purchased.

The following diagram outlines a method which, if followed step by step in the sequence indicated, provides a rapid point to point method of signal tracing. The receiver functional diagram illustrated is a complex case. It is reasonable to assume that most receivers will contain only one IF stage and many more will be found to lack an RF stage preceding the mixer.

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